

CLAIMS

1. An optical element device comprising an optical element and an optical path transforming structure for changing a light proceeding direction
5 in order to couple light with the optical element or light from said optical element with some other element, said optical path transforming structure being formed by processing a substrate where said optical element is formed.
- 10 2. The device according to claim 1, wherein said substrate is made of a material that does not absorb light being propagated from said optical element or to said optical element.
3. The device according to claim 1, wherein
15 said substrate is a growth substrate of a semiconductor layer for forming said optical element.
4. The device according to claim 3, wherein said growth substrate is formed by using a compound semiconductor.
- 20 5. The device according to claim 1, wherein said optical element is a light emitting element or a light receiving element.
6. An optical waveguide device comprising an optical element device including an optical element
25 and an optical path transforming structure for changing a light proceeding direction in order to couple light with the optical element or light from

said optical element with some other element, and an optical waveguide layer optically coupled with said optical element and propagating light from said optical element or to said optical element;

5 said optical path transforming structure being formed by processing a substrate where said optical element is formed.

7. The device according to claim 6, wherein said optical waveguide layer is formed by using
10 a sheet-shaped object.

8. The device according to claim 6, wherein said optical path transforming structure has a spherical, wedge-shaped, conical or pyramidal profile.

9. The device according to claim 8, wherein
15 said optical path transforming structure is formed near the optical element that is a light emitting element so as to couple light emitted from said light emitting element and said light emitting element is so configured as to be able to change its
20 light irradiation angle, while said optical path transforming structure is configured to transform the optical path so as to propagate light emitted from the light emitting element coupled therewith into the inside of said optical waveguide layer as a beam of
25 light or light diffusing with an angle corresponding to the light irradiation angle.

10. The device according to claim 6, wherein

said optical path transforming structure is buried into said optical waveguide layer.

11. The device according to claim 6, wherein said optical waveguide layer is formed by using
5 the substrate where said optical element is formed.

12. A method of manufacturing an optical element device having an optical element and an optical path transforming structure for changing a light proceeding direction in order to couple light
10 with the optical element or light from said optical element with some other element, said method comprising:

a step of preparing a substrate for forming said optical element; and

15 a step of forming said optical path transforming structure by processing said substrate.

13. The method according to claim 12, wherein said step of forming said optical path transforming structure includes a step of forming a
20 recess in said substrate and forming a metal film in the recess.

14. The method according to claim 13, wherein said step of forming a recess includes a step of irradiating an ion beam on the surface of said
25 substrate in a direction inclined relative to said surface.

15. The method according to claim 13, wherein

said step of forming a recess includes a step of dry etching, using a reactive ion beam.

16. An optoelectronic circuit board comprising an electric circuit board formed so as to
- 5 establish electric connection with an optical waveguide device having an optical element device including an optical element and an optical path transforming structure for changing a light proceeding direction in order to couple light with
- 10 the optical element or light from said optical element with some other element, and an optical waveguide layer optically coupled with said optical element and propagating light from said optical element or to said optical element;
- 15 said optical path transforming structure being formed by processing a substrate where said optical element is formed.